ENG 21

Civic Scientific Literacy Essay

Environmental impact of bitcoin mining.

The environmental impact of Bitcoin mining is a subject that attracted my attention due to its intersection of two critical issues: the growing popularity of digital currencies and the urgent need for sustainable environmental solutions. Bitcoin mining consumes increasing amounts of electricity, primarily coming from fossil fuels. It has also been contributing to carbon emissions and accelerating the degradation of climate. This dilemma raises concerns about the long-term effects of cryptocurrencies and increases the need for alternatives for energy sources. My not-so-long investment in the topic of environmentalism, which is more of a hobby, adds to the personal concern for flora and fauna, as the effects of environmental negligence are starting to affect the world around us.

Title: The Real-World Costs of the Digital Race for Bitcoin. Date: April 9, 2023. Authors: Gabriel J.X. Dance, Tim Wallace and Zach Levitt.

The precise structure discussed in the article is the cryptocurrency mining facilities, the number of which has been increasing not only in the United States, but in other parts of the world, including Kazakhstan, Russia, Canada, Ireland, Malaysia and Germany. (Bitcoin Mining By Country, 2023).

Crypto mining facilities are also known as mining farms. They are specialized locations equipped with high-performance computer hardware and infrastructure dedicated to the sole process of mining cryptocurrencies like Bitcoin. These facilities are designed to minimizing the downtime, maximizing efficiency and profits.

The process of mining the Bitcoin involves solving complex mathematical puzzles through a process called proof-of-work (PoW). The POW block chain tech used by Bitcoin is energy intensive and requires a lot of equipment. Independent miner sites compete to find a solution to the puzzle. The goal of these computations is to find the hash, which verifies transactions and secures Bitcoin network. The first one to solve it receives newly minted Bitcoins, as a form of payment. “Providing the correct hash identifier employs enormous amounts of energy due to the decentralized production process, which encourages competition and creates a “winner-take-all” game” (Jones, p. 2).

The operation of a crypto mining facility involves several key components, including specialized hardware, substantial power supply, and efficient cooling systems. The process requires a large amount of mining rigs, which are specialized computers built specifically for mining cryptocurrencies. These rigs are equipped with powerful processors or more commonly, graphics processing units and other highly technological components. (Read, p. 138) These hardware components perform complex mathematical calculations required to validate and process transactions within Bitcoin network. Another important component is the stable power supply.

The mining farms typically require a substantial amount of electricity due to the high computational demands and constant competition. As a result, mining facilities often seek locations with affordable electricity rates (Read, p.139-140). Mining facilities also rely on robust cooling systems to dissipate the heat generated by the mining rigs. Heat can be a significant challenge, as the intensive computational operations can cause the hardware to overheat. Cooling mechanisms such as air conditioning, liquid cooling, or specialized cooling systems are employed to ensure optimal operating temperatures.

Bitcoin mining has been associated with negative environmental impacts because of the increasing energy consumption. The process of mining Bitcoin requires a lot of computational power, which asks for a large amount of electricity. Many Bitcoin mining operations rely on energy sources, such as fossil fuels, coal, natural gas, to power crypto mining farms. The use of non-renewable energy causes emissions released in the atmosphere and increases already-growing levels of carbon dioxide. Another aspect leading to high energy consumption is due to the competitiveness of Bitcoin mining. This led to a race for more efficient and powerful mining equipment. Therefore, specialized mining rigs with high-energy consumption became more popular, consuming even more electricity. The collective energy consumption of Bitcoin mining globally has been compared to that of entire countries. According to some estimates, Bitcoin mining consumes more energy than several individual countries, raising concerns about its sustainability and environmental impact.

The environmental impact of Bitcoin mining has provoked the search for more sustainable energy-uses within the cryptocurrency industry. Some of the popular ideas argue for the use of renewable energy sources for mining operations, such as hydroelectric power plants or utilization of solar and wind energy. There has also been an attempt to develop alternative mechanisms for cryptocurrency mining that require less enegry, such as proof-of-stake (PoS) instead of proof-of-work (PoW). Benjamin Jones describes the process in the following way: “POS works by requiring validators to hold and stake coins, with the next block writer on the blockchain being selected at random, with higher odds being assigned to those with larger stake positions” (Jones, p.6) This method eliminates the need for endless computational calculations performed in PoW mining, which requires highly technical and energy-consuming hardware. Jones also explores the environmental effects caused by bitcoin by using something known as Social Cost of Carbon (SCC). SCC estimates economic damage that would appear as a result of emitting an additional ton of carbon dioxide released into the atmosphere. According to the research, Jones refutes two conclusions about the mining industry:

> *As the industry matures, the trend of the estimated climate damage per BTC mined increases,*
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> and
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> *Per BTC mined, its estimated climate damage exceeds its market price, on most occasions* (Jones, p. 3-4).

Even though the changes of converting to POS are negligible, much success could be found with the use of renewable energy.

With the use of renewable energy and nuclear power, Jones concludes “Compared to the baseline renewable share, increasing use of renewables in BTC mining reduces associated climate damages per coin mined” (Jones, p. 4). However, the environmental impact does not stop growing, as long as there is a growing increase in the use of non-renewable energy. “Thus, even if BTC miners obtained the majority of their electricity from renewables and directly carbon free sources, there are still large and growing climate damages” (Jones, p. 5)

NYT article “The Real-World Costs of the Digital Race for Bitcoin” describes a scenario, where the impact of crypto mining moved to the social aspect, resulting in power shortages and losses of human lives. Although the superstructure is hard to blame by itself, those in control can potentially be held accountable for narcissistic tendencies. In February 2021, as the result of a winter storm, tens of thousands of homes in the state of Texas were left without electricity. At least 40 people lost their lives to the freezing cold. At the same time, the adjacent city was running a mining farm, using enough electricity to power 6,500 homes. This scenario demonstrates how cryptocurrency mines can directly affect the risk of losing one’s life. While carbon emissions can be neglected due to their invisibility to the human eye, something as catastrophic as the risk of being left without energy during a winter storm can be considered threatening.

In conclusion, the negative environmental impact of Bitcoin mining arises from its substantial energy consumption, often derived from non-renewable sources, and the associated carbon emissions. Failure to take immediate action can have severe consequences for human lives and our planet. The unstoppable energy consumption used for crypto mining, including fueled by non-renewable sources, contributes to greenhouse gas emissions and accelerates environmental collapse. Rising temperatures, extreme weather events, and ecosystem disruptions are just a few manifestations of climate change's devastating effects.

This topic has tremendously impacted my understanding of cryptocurrencies and understanding of the balance between technological progress and its environmental impact. Although the solution is still being searched for, the awareness of the issue can be helpful to create a concern among crypto-enthusiasts and provoke new ideas to resolve the problem.

References:

Colin L. Read, *The Bitcoin Dilemma,* Springer Nature publishing company, 2022.

Bitcoin mining by country 2023. (n.d.). https://worldpopulationreview.com/country-rankings/bitcoin-mining-by-country

Jones, B. A., Goodkind, A. L., &amp; Berrens, R. P. (2022). *Economic estimation of bitcoin mining’s climate damages demonstrates closer resemblance to digital crude than Digital Gold*. Scientific Reports, 12(1). https://doi.org/10.1038/s41598-022-18686-8

Jabłczyńska, M., Kosc, K., Ryś, P., Sakowski, P., Ślepaczuk, R., &amp; Zakrzewski, G. (2023). *Energy and cost efficiency of bitcoin mining endeavor*. PLOS ONE, 18(3). https://doi.org/10.1371/journal.pone.0283687